

DETERMINANTS OF ADOPTION OF SOLAR ENERGY FOR HOME USE IN NAIROBI CITY COUNTY, KENYA

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International Academic Journal of Arts and Humanities (IAJAH) | ISSN 2520-4688

Received: 30th May 2023

Published: 8th June 2023

Full Length Research

Available Online at: https://iajournals.org/articles/iajah_v1_i3_167_183.pdf

Citation: Ongeru, G., Mbataru, P. (2023). Determinants of adoption of solar energy for home use in Nairobi City County, Kenya. *International Academic Journal of Arts and Humanities*, 1(3), 167-183.

ABSTRACT

This study aimed at establishing the determinants of adoption of solar energy for home use in Nairobi County. The results from this study have helped to understand why few households in Nairobi County are using solar and recommended appropriate policy interventions in making Nairobi a sustainable City with clean and affordable source of energy by utilizing solar energy available in plenty in Nairobi. The objectives included establishing the influence of; awareness on solar energy and alternative power sources, on adoption of solar energy for home use. The research was carried out in the County of Nairobi City across all the 11 sub counties where a sample of 384 households were studied. This sample size of 384 was collected using stratified random sampling method because the target population in this study that comprises of 138,976 homeowners in Nairobi County was already divided into Sub counties. The study was based on the Social Cognitive Theory on the idea of self-efficacy and the Technology Adoption Model (TAM), which has been extensively used in technology adoption studies, and the Diffusion of Innovation (DOI) Theory, which tries to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. Descriptive survey research design was used where quantitative and qualitative data was gathered. Various research instruments like

questionnaires and interview were utilized. The data gathered was analyzed by SPSS which is a data analysis software. The data is exhibited through statistical techniques which include frequency and percentages distribution tables and graphs. Permission was sought from relevant authorities starting with Kenyatta University, NACOSTI, subcounty commissioners and chiefs. Confidentiality was guaranteed to all participants. From the study, the findings indicate that few residents of Nairobi City County have adopted solar energy. This can be attributed to lack of awareness on solar energy as most respondents indicated that they had never received any formal or informal training, not aware of solar technology providers and had never seen solar energy in use. The study also concluded that alternative power source has also deterred solar adoption as 88.2% of the respondents are connected to electricity which is readily available while 87.7% prefer other sources instead of solar. The study therefore recommended to the Government of Kenya and other stakeholders that deal with solar energy to provide training and awareness on use of solar, to avail solar power so that it's readily available to be adopted, the government to reduce the cost of solar installation and formulate policies that encourage solar adoption.

INTRODUCTION

Countries around the world use various energy mixes to satiate their rising energy needs. According to (Hannah Ritchie, 2020) Since the industrial revolution, fossil fuels have dominated the energy mix of the majority of nations worldwide. The usage of fossil fuels significantly affects both the climate of the globe and human health. The majority of global greenhouse gas emissions are primarily caused by the burning of fossil fuels for energy. At least 5 million people die before their time each year as a result of the severe local air pollution and health issues brought on by these fossil fuels. The world has to quickly transition to renewable technologies, including solar energy, which will aid in the decarbonization of our energy systems in the next years, in order to minimize CO₂ emissions, which are to blame for local and global air pollution.

There is low use of solar energy globally, though in recent times its consumption is increasing. For instance, it was anticipated that solar photovoltaic system (PV) power generation climbed by a record 156 TWh in 2020, a 23% rise from 2019. Solar power, which surpassed biofuels in 2019, now ranks third among renewable energy sources behind onshore wind and hydropower with 3.1% of the world's electricity generated (IEA, 2021).

As per the reports from the industry, solar energy installations in the USA increased at a record rate in 2008 both domestically and globally. Data from the Solar Energy Industries Association show that in 2007, the U.S. solar energy capacity expanded by 17%, reaching a total equivalent of 8775 megawatts (MW). In 2007, the United States installed 139 Thermal megawatts (MWTh) of solar water heating, 342 MW of solar photovoltaic (PV) electric generation, 21 MWTh of solar space heating and cooling, and 762 MWTh of solar pool heating, according to a report by the Solar Energy Industry Association (SEIA) (K.H. Solangi, 2011).

A similar journal article by K.H. Solangi (2011) reveals that worldwide solar market reached US\$ 11.8 billion in 2005, an increase of 55% from 2004. Compared to 2.7 GW in 2006, solar projects were predicted to produce 15 GW in 2010. Photon Consulting predicted in April 2007 that sales of solar energy equipment would generate US\$90 billion in revenue by 2010, up from US\$20 billion in 2006. From 41,000 tons in 2006 to 120,000 tons in 2010 and 400,000 tons in 2015, the need for silicon for solar cells was predicted to rise. The journal paper forecasts the installation of solar photovoltaic electricity in the United States, Europe, Japan, and other countries until 2030.

Africa receives more hours of brilliant sunshine than any other continent on earth, earning it the nickname "the sun continent." Solar energy does not yet have a high penetration rate, despite its evident potential. According to the World Bank, the installed solar energy capacity in Africa is just half that of the United Kingdom (Roussi, 2022). In much of the developing world,

residential families have not yet fully embraced and utilized solar energy, despite the fact that household energy usage significantly contributes to climate change (Korir, 2020).

With an average of 5-7 peak sunshine hours per day and 4-6 KWh/m² of insolation per day, Kenya has high insolation rates. This is one of the underutilized sources of energy especially in urban areas which are densely populated where it can be used to provide lighting, heating and running of electric appliances. In Kenya, the government census 2009 estimated the population to be more than 38 million and the city of Nairobi houses 3.5 million of them. The population of Kenya was anticipated by the Kenya Bureau of Statistics to reach over 47 million in 2019, with Nairobi County ranking as the most populous region with 4.3 million individuals or 1.4 million homes, indicating a strong need for energy for domestic consumption. These households in Nairobi County depend on non-renewable energy and renewable sources. Renewable energy sources are those sources of energy that regenerate over a short period of time after they have been used and hence cannot be depleted. This includes biomass, wind energy, solar energy and geothermal. Nonrenewable sources of energy are those sources of energy that cannot regenerate over a short period of time after use and hence can be depleted for example fossil fuels.

In homes, fossil fuels are commonly used, However, they are considered costly and their prices increase consistently, they are also considered to be the greatest contributors to global warming and formation of acid rain. This is as a result of release of toxic gases such as nitrogen oxide and Sulphur dioxide to the atmosphere. Adoption of renewable sources of energy like solar will not only be cheaper but also will contribute positively to the environment by reducing release of harmful gases like nitrogen oxide and Sulphur dioxide.

Although the introduction and use of solar energy is not yet fully accepted in most regions of the developing world and is not accepted at home, energy use at home is a significant contributor to climate change (Korir,2020). Adopting solar energy especially in urban areas like Nairobi City County which are densely populated will therefore play a significant role in reducing pollution hence mitigating problems brought about by local pollution and climate change and its effects. Knowing various determinants for adoption of solar energy in urban areas will greatly help to formulate policies that will enable people adopt more renewable sources of energy which is in support of SDGs 7 and 11, to have affordable and clean energy and sustainable cities.

Statement of the Problem

There are few researches that have looked at the elements impacting the renewable energy adoption in Kenya. (Lay, 2012), for example, found that household head and economic factors influence the adoption of solar and biogas energy. (Gitone, 2014) examined the relationship between household head characteristics and renewable energy deployment. Few authors have thoroughly investigated other determinants of solar adoption. So, this study is going to look at

these determinants which have not been comprehensively tackled by most studies hence a gap to be filled. They include how awareness on solar energy, cost of installation, cost of alternative sources of energy, and government policy influence solar energy adoption for home use especially in Nairobi City County which is one of the most populated counties in Kenya.

The findings will also help understand why few households in Nairobi County are using solar energy, for example 2.7 percent use solar for lighting while 0.1percent use solar for cooking compared to 53.9 percent who are using paraffin (KNBS, 2019) despite solar energy being available in plenty and being part of the solution to global warming. The results of this survey will assist to recommend appropriate policy interventions in making Nairobi a sustainable City with clean and affordable source of energy by utilizing solar energy available in plenty in Nairobi which is estimated to be an average of 4.5kwh/m² throughout the year (GEOMODEL, 2013).

Objectives of the study

- (i) To identify how awareness on solar energy affect its adoption in Nairobi County.
- (ii) To determine the influence of alternative power sources on adoption of solar power.

LITERATURE REVIEW

This section delved into theoretical and empirical literature to help build a body of literature on the subject

Theoretical Framework

Diffusion of Innovation (DOI) Theory

One of the earliest social science ideas is this one, which E.M. Rogers established in 1962, according to (Mishra, 2014). In DOI, the author explains how a concept or product spreads among a particular demographic through time. People gradually incorporate new concepts, behaviors, or items into their social systems as a result of this diffusion. Adoption is when someone changes what they normally do, buys or uses new things, or learns and puts new behaviors into practice. The important principle in this situation is that for an idea, deed, or product to be adopted, a person must be regarded as novel or unique. The use of this allows for diffusion. Embracing a new idea or conduct in a social framework is certainly not a one-time occasion; rather, it is a cycle where certain individuals are bound to acknowledge the development than others. Researchers have found that the individuals who embrace developments sooner than others have various characters. It is fundamental to fathom the qualities of the objective market that will work with or block acknowledgment of the development while advertising it to that group. This hypothesis will aid in the study's comprehension of the factors that affect the solar energy adoption, a relatively new

technology in Nairobi City County, as well as how the traits of the intended audience have an impact on solar adoption.

The Social Cognitive Theory (Bandura, 1986):

This Social Cognitive theory is based on the idea of self-efficacy, which is an assessment of one's capability to utilize technology to complete a specific activity or job. The foundation of this theory is perceived self-efficacy, or beliefs about one's capacity to plan and carry out actions required to achieve predetermined performance levels. According to this social cognition paradigm, foresight has a significant influence on human motivation and behavior. This theory outlines a number of crucial elements that influence behavior, such as expectations that may be related to the results of a specific action. The impression of self-efficacy is the first of social cognitive theory's key ideas. It relates to people's confidence in their capacity to carry out particular tasks required to obtain desired outcomes. The idea of social cognitive behavior also emphasizes outcome expectations. It focuses on what people think will happen if they act in a certain way. Goals, perceived obstacles, and facilitators are all included in the social cognitive theory. This will be beneficial to this research, particularly in terms of increasing awareness of solar energy consumption and how participants in the study interpret the results of solar energy use.

How awareness on solar energy affects its adoption.

In an article by Yonghee Choa (2019), the researchers found four regions that they recommended based on spatial analysis in areas of study where individuals had high education and income levels but there were few solar PV adopters. They suggested that this might be because people aren't aware of and knowledgeable about this technology. According to the study, in order to alleviate the impact of change in climate in the face of environmental, economic, and political concerns, new energy policies are urgently required. In order to encourage the adoption and diffusion of solar photovoltaic panels in Europe and the United States, it was determined that incentives, education, and promotion measures were crucial. To improve adoption outcomes, it was advised that solar energy initiatives in these regions be encouraged and promoted.

Gichui (2016) conducted a study to determine the extent of solar energy technology adoption in Kiambu County, Kenya. To enable researchers to define, document, evaluate, and report on the aforementioned conditions, researchers utilized a descriptive survey design and a stratified random sampling strategy to choose samples for their investigations. The acquired data was then subjected to both qualitative and quantitative analyses by the researchers. This improved our understanding of the elements affecting the solar energy adoption including the contribution of household income to the acceptability of solar energy use and the contribution

of relative advantage. As per the results, the residents of Kiambu County have not embraced solar energy technology to a great extent, which may be linked to the lack of official or informal training on its usage, which has resulted in a low level of awareness and knowledge of solar energy and its application. The level of awareness and knowledge among those who had installed solar energy systems in their homes, seen solar lamps or solar electricity in action, were aware of the manufacturers of solar technology, and had undergone some informal training all had an impact on the acceptance of the technology. The research also concludes that absence information on monetary opportunities influenced the adoption of solar technology as it was perceived to be expensive by most respondents. The researcher then concluded that few residents of Kiambu County have not adopted much to Solar Energy Technology, which can be due lack of informal or formal training on solar energy technology utilization which resulted to the level of awareness and knowledge about solar energy and its utilization being relatively low. The study is comprehensive though it was carried out in a county with most population living in rural area which affects their energy demand. This leaves a gap on how awareness will impact solar adoption in urban areas like Nairobi City County with high energy demand.

A study conducted by Atika (2015) on variables that have influenced homes in Nairobi County to choose solar water heaters. In this study, the researcher used triangulation to help with data collection, and respondents were chosen for key informant interviews by using a purposive sample of households, key partners from the real estate developers, Ministry of Energy and Petroleum and agencies like the Energy Regulation Commission. Data from the survey were gathered in the Nairobi County constituencies of Embakasi West, Ruaraka, and Dagoretti North. Due to restrictions on accessibility to some sites, the research ultimate sample size of 58 was lower than the researcher's aim of 120. The study comes to the important conclusions listed below. SWH systems are first divided into active and passive systems. A sizable percentage of families also said that SWH systems were simple to use. The study also found that, despite a high degree of SWH adoption by the participants, hot water use was mostly restricted to bathing. A large proportion of the tested households also mentioned using additional water heating equipment. Lack of awareness and knowledge, financial and economic considerations, technical factors, institutional factors, and social factors were some of the challenges cited as influencing the adoption of SWH systems. The survey found that there were a number of factors influencing Nairobi households' adoption of solar water heaters. One of the main aspects preventing the solar water heaters adoption was mentioned as a lack of knowledge and awareness. This study will supplement that knowledge by focusing not just on solar-powered lighting and cooking, but also on solar-powered water heaters and other appliances. While this research would utilize descriptive survey and stratified random sampling in collection of data in all the 11 sub counties of Nairobi City County hence a more representative sample than the researcher's triangulation-based data collection and respondents were purposively sampled.

In a journal article, William Philip Wall (2021) carried a study with the objective to explore the variables that affect the renewable energy adoption by adoption in Thailand. An extensive theory of planned behavior was employed in the study. The researcher used a quantitative study approach, and in five important Thai cities, a survey of consumers was performed to gather primary data. The researcher used structural equation modeling to analyze the data (SEM). The study's findings and conclusions said that consumers' perceptions of their own efficacy, knowledge of renewable energy, environmental concern, and attitudes about its benefits are favorably and significantly influencing their intents to use it. The adoption of renewable energy sources by consumers was found to be positively impacted by risk or trust perception, although not significantly, whereas the cost of renewable energy sources had a negative but non-significant impact on adoption. Researchers therefore concluded that in conducting a campaign to promote consumer acceptance of renewable energy in Thailand: Stakeholders should consider different aspects of self-efficacy, environmental awareness, awareness of renewable energy, and perception of the benefits of renewable energy.

How alternative sources of energy affects adoption of solar energy

Omwenga S, C (2018) conducted research in Kenya's four counties of Kisumu, Nairobi, Meru, and Kiambu for research on the renewable energy adoption in Kenya relied on a case study of biomass briquette production and its application in industrial boilers. While briquette production took place in Kisumu County, Meru, Nairobi, and Kiambu counties were responsible for its utilization in boiler operations. The quantitative and qualitative research techniques were employed in the study. The utilization of field surveys and statistical analysis allowed for the collection of pertinent data for evaluating research ideas. A variety of statistical presentation techniques, including graphs, tables, averages, and maps, were used to arrange and present this data. Using the chi square and Z-test, the study's hypotheses were put to the test. The survey conducted a correlation analysis of the cost of fossil fuel and biomass briquettes and discovered that, in both cases, high tonnage briquette uses variable scores and high cost of fossil fuel variable scores go hand in hand. The study also discovered that boiler operators chose to run fossil-fueled boilers rather than biomass boilers when the price of heavy fuel oil dropped. The study demonstrates how the accessibility of alternative energy sources might affect the renewable energy sources adoption. There is a vacuum in the research that has to be filled because it did not examine how solar energy influences the adoption of biomass.

In a study, Tahir Masood Qureshia (2016) discovered that, despite their high initial costs, relatively few people are more motivated to set up solar PV systems to ensure an uninterrupted supply of electricity. This finding indicates that the solar PV system's high upfront costs and the need for a reliable electricity supply dissuaded potential adopters from considering its installation. Additionally, the dissemination of PV systems was found to be significantly influenced by their accessibility in local markets, which was trailed by the best alternative source for reliable

electricity supply. This study investigates the elements affecting household decisions on the solar PV adoption in the Lahore region of Pakistan. The list of important factors was initially taken from the literature. Later, thorough interviews based on Roger's innovation theory's persuasion characteristics at the household level, a survey of solar PV non-adopters and adopters was undertaken to rank the variables according to their importance in the choice to adopt solar PV. The study finds out that alternative sources is one of the determinants in energy adoption in Lahore, Pakistan especially electricity. This might be different in Nairobi City County as more alternatives will be studied and their effect to adoption of solar energy for home use.

In an article by (Bilal Khalid, 2021) on identifying the variables that affect technology adoption in light of how crucial it is to environmental preservation. It was primarily quantitatively done, with primary data gathered from 467 Polish families employing renewable energy technology. The TAM model theory was used in the study. According to the report, using renewable energy is essential for maintaining environmental preservation by preventing global warming and, as a result, climate change. In comparison to other energy sources, the acceptance and utilization of renewable energy is positively impacted by the rise in environmental concerns. This study discovered that renewable energy adoption in Poland is significantly and favorably impacted by environmental concern. This meant that factors like protecting the environment and preventing energy source pollution would have a beneficial impact on the renewable energy technology adoption. The outcomes establish that, in Poland, renewable energy adoption would grow by 0.355 units relative to alternative sources for every unit increase in environmental conservation characteristics.

In a study by Patrick (2021) that sought to evaluate the generation and consumption of renewable energy, contemporary renewable energy plans and projects (geothermal, wind, solar and biogas) in Oman were included. The majority of the data included in the study came from scientific databases, government databases, and international organizations. According to research findings, Oman has only been producing renewable energy from solar sources since 2017, with other sources not being sufficiently investigated or used. Additionally, the nation has disclosed ambitious plans for the production of renewable energy, which prompted investments in many megawatts (MW) worth of wind farms, solar power plants, and biogas energy projects throughout the entire nation. The existing goal for Oman's contribution of renewable energy is 30% by 2030, rising to between 35 and 39% by 2040. Additionally, it has been determined that offshore power generates about 1.3 more energy than onshore or land-based electricity. The few geothermal reservoirs that are now in existence, namely those with low (70–90 °C) and medium (100–174 °C) enthalpy, have not been studied, and no projects have yet been started. As a result, there is an urgent need for an energy source-specific strategy as well as research and development initiatives for the discovery, production, and usage of renewable energy.

For the examining the worldwide competitive dynamics of fossil fuels and renewable energy, Al (2020) created a stochastic decision model. It speaks of solar, wind, and coal. The model aims to explain how learning curves, route dependence, and environmental policies affect outcomes. According to the study, peak oil causes a diversion from renewable energy toward coal, which exacerbates climate change and global warming. According to the study, the implementation of climate policies like a carbon tax, market acceptance or R&D grants for renewable energy sources, and the exclusion of current fossil fuel subsidies could result in transitional patterns toward a low-carbon energy system.

Two key aspects of climate policy that aim to address the climate problem are made clear by the study model. This includes the ones that discuss maintaining the necessary carbon budget as well as the ones that discuss how unpredictable or varied the eventual market shares of various energy sources are. In order to accomplish this, the research creates a formal model that describes the four main energy sources that compete on a worldwide scale: coal, gas or oil, wind and solar. The study focuses on these four because they are important now or might be in the future, because they have two different types of fossil fuels with various carbon intensities and because they have two different types of renewable energy sources with varied costs and rates of adoption. The structure that results allows for addressing the major issues involved in studying a shift from fossil fuels to renewable energy, such as which renewable energy source is more likely to proliferate or merits more policy support, at the end. Due to their partial substitution in the model, gas and oil are merged for simplicity. The study examines how policies and alternative sources affect the uptake of renewable energy sources. However, it is not clear how legislation and the availability of other energy sources affect the solar energy adoption, and this is the issue that will be covered in this study.

RESEARCH METHODOLOGY

This survey employed a descriptive survey design to describe the determinants of solar adoption for household use in Nairobi City County. This research was conducted in Nairobi County across the 11 sub counties: Dagoretti, Kamukunji, Embakasi, Kasarani, Kibra, Makadara, Lang'ata, Mathare, Starehe, Njiru, and Westlands. The Nairobi City County is the most populated county in Kenya with a population of 4,397,093 as per the 2019 Census by Kenya Bureau of statistics. This implies that it is one of the biggest users of energy in household, so finding out the determinants of energy adoption specifically solar energy was be a better representative for most urban counties in Kenya which need to adopt renewable sources of energy to create sustainable cities. The sample size was 384 according to Board (2003). The sample was picked from each Sub County randomly in proportion to the number of owned homes in each Sub County.

Questionnaires were created after evaluating the variables of the research to guarantee that the study's objectives are captured with open-ended and closed questions. Interviews were also be utilized to collect data both qualitative and quantitative using structured and semi structured formats. Observation was used to read the behavior of the respondents. Secondary sources will also be used to get both quantitative and qualitative data.

This data gathered was both qualitative and quantitative. Content analysis was utilized to examine qualitative data, while inferential statistics and descriptive will be utilized to analyze quantitative data using the electronic spreadsheet SPSS application, which includes analysis tools. The Chi square test was performed, and logistic regression will be utilized for continuous variables to show relationship.

RESULTS AND FINDINGS

The researcher distributed 385 self-administered questionnaires to the randomly selected respondents. 373 questionnaires were returned which represented 97 percent response. On gender, 44.2 percent of the respondents were male while 55.8 percent were female. On marital status, 24.7 percent of the respondents were single, 66.8 percent of the respondents were married, 5.1 percent of the respondents were divorced, 2.1 percent were widowers while 1.3 were widows. On age group distribution, 1.6 percent of the respondents were of age 18-24yrs, 4.6 percent were 25-29yrs, 6.7 percent were 30-34 yrs, 12.3 percent were 35-39years, 12.3 were 40-44 years, 35.4 percent were 45-49 years, 13.1 were 50-54 years, 9.7 percent were 55-60 years while 4.3 percent were of age 60 and above years.

Level of Awareness on Solar energy for home use

The study sought to address the first objective of the study which was seeking to identify how awareness on solar energy affect its adoption in Nairobi County. The respondents were asked their major choice of source of energy, if they have ever seen a solar energy in use, if they are aware of any solar technology providers in Nairobi County or if they have received any informal or formal training on solar energy.

Main choice of source of energy

The respondents were asked their main source of energy and their responses are shown on table 1 below.

Table 1 Main choice of source energy for the respondents(n=373)

| Category | Frequency | Percent |
|-------------|-----------|---------|
| Solar | 34 | 9.1 |
| Firewood | 57 | 15.3 |
| Gas | 6 | 1.61 |
| Paraffin | 18 | 4.8 |
| Dry Cells | 10 | 2.7 |
| Electricity | 248 | 66.5 |

Respondents were asked their main choice of source of energy in their homes. 9.1 percent said they use solar as their main source of energy, 15.3 % said firewood, 1.61% use gas, 4.8% use paraffin, 2.7 % use dry cells while 66.5% use electricity as their main source of energy.

Solar energy usage

The research sought to find out the number of respondents who had ever seen solar energy in use. The responses are as shown on Table 2 table below.

Table 2 respondents who have seen solar energy in use(n=373)

| Category | Frequency | Percent |
|--------------------------------|-----------|---------|
| Seen solar energy in use | 143 | 38.3 |
| Never seen solar energy in use | 230 | 61.7 |

38.3 percent of the respondents had seen solar energy in usage while 61.7 % had never seen solar energy in use. This shows majority of the respondents have never seen solar energy in use. This will not affect the subsequent responses in any way.

Awareness on solar technology providers in Nairobi City County

Table 3: Awareness on solar technology providers in Nairobi City County(n=373)

| Category | Frequency | Percent |
|---|-----------|---------|
| Aware of solar technology providers | 42 | 11.3 |
| Not aware of solar technology providers | 331 | 88.7 |

The selected respondents were asked if they are aware of any solar technology providers in Nairobi City County. 11.3 % indicated that they were aware of technology providers while 88.7% indicated that they were not aware of any technology providers. This shows that many of the respondents are not aware of solar technology providers in Nairobi County.

Formal or Informal Training on Solar Energy

The research sought to know those who had received formal or informal training on solar energy. The responses are as shown on table 4 below.

Table 4 Formal or informal training on solar energy (n=373)

| Category | Frequency | Percent |
|---|-----------|---------|
| Received informal or formal training on solar energy | 40 | 10.7 |
| Not received any formal or informal training on solar energy. | 373 | 89.3 |

From the responses 10.7 % of the respondents had received formal or informal training on solar

energy while 89.3 had not received any training on formal or informal training on solar energy. This implies that a majority of the respondents had not received any training on use of solar energy.

Alternative source of energy

The researcher sought to find out the influence of alternative power sources on adoption of solar energy. The respondents were asked if they are connected to grid power which is a substitute to solar energy, if they use any wood-based fuel like wood or charcoal and if they prefer to use any other energy source rather than solar energy.

Connection to grid power

The researcher here sought to find out the number of respondents who are connected to grid power which is an alternative to solar energy. The responses are as shown on table 5 below.

Table 5 respondents who are Connected to Grid Power (n=373)

| Category | Frequency | Percent |
|-----------------------------|------------------|----------------|
| Connected to grid power | 329 | 88.2 |
| Not connected to grid power | 44 | 11.8 |

88.2 % of the respondents in Nairobi City County indicated that they are connected to grid power while 11.8 % indicated that they are not connected to power. This shows that the majority of the respondents are connected to grid power maybe due to the area being an urban area.

Usage of wood-based fuel sources

The researcher sought to find out if the respondents use any wood-based fuel like wood or charcoal. The responses are as shown on table 6 below.

Table 6 usage of wood-based fuel sources(n=373)

| Category | Frequency | Percent |
|------------------------------------|------------------|----------------|
| Use wood-based fuel sources | 65 | 17.4 |
| Do not use wood-based fuel sources | 308 | 82.6 |

17.4 % indicated that they use wood-based fuel sources while 82.6 % indicated that they do not use wood-based fuel sources. This implies that most of the respondents do not use wood-based fuel sources. This might be because of the area being an urban area.

Preference of using other energy sources instead of solar

The researcher asked the respondents if they prefer to use other energy sources rather than solar energy. The responses are as shown on table 7 below.

Table 7 preference of using other sources of energy(n=373)

| Category | Frequency | Percent |
|---|-----------|---------|
| Prefer using other sources of energy instead of solar | 327 | 87.7 |
| Do not prefer using other sources of energy | 46 | 12.3 |

87.7 % of the respondents prefer using other sources of energy instead of solar energy while 12.3 % do not prefer using of other sources of energy apart from solar energy. This implies that the majority of the respondents prefer using other energy sources instead of solar energy source.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of the findings

The first objective of this research was to identify how awareness on solar energy affect its adoption in Nairobi City County. 9.1 % were using solar as their main source of energy, 38.3 % of the respondents indicated that they had seen solar energy in use 88.7 % indicated that they are not aware of any solar technology providers in Nairobi City County while 89.3 % indicated that they had not received any formal or informal training on solar energy. This shows that lack of awareness negatively affected solar adoption for home use in Nairobi City County.

The second objective sought to establish the influence of alternative power sources on adoption of solar power for household use in Nairobi City County. The findings indicated that 88.2 % of the respondents are connected to grid power and 87.7% indicated that they prefer using other sources of energy instead of solar. This implies that alternative power sources on adoption negatively affects solar adoption.

Conclusions

Therefore, the study concludes that there are few people in Nairobi City County that have adopted solar energy. The few who had adopted indicated that they had seen solar energy in use, were aware of solar technology providers and had received informal or formal training on solar energy. This shows that awareness on solar energy influences its adoption. The study also concludes that availability of alternative sources of energy decreased the rate of solar adoption. Most people connected to the grid for electricity as it is readily available reducing the number of people who were adopting solar energy.

Recommendations

From the above findings this research recommends the following:

1. The research showed that there is a relationship between awareness on solar and its adoption. Those who got formal or informal training and were aware of solar technology providers adopted solar energy for their home use. The Government of Kenya and other stakeholders that deal with solar energy to provide training and awareness on the use of solar energy. This can be done through media, seminars and workshops or even incorporate solar energy curriculum in learning institutions to educate people on use and benefits of solar energy.
2. The study also found out that the more the solar the more the alternative the lesser the solar adoption. Most respondents went for electricity and those who were not connected to electricity went for wood or charcoal. The Government to avail solar power to most people especially the residents who are not connected to electricity, so that there will be more adoption of it instead of wood which is contributing to release of carbon to the atmosphere.

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